

NORWALK HARBOR, CONN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON
PRELIMINARY EXAMINATION AND SURVEY OF NORWALK HAR-
BOR, CONN.

AUGUST 8, 1914.—Referred to the Committee on Rivers and Harbors and ordered to
be printed, with illustration.

WAR DEPARTMENT,
Washington, August 7, 1914.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, of this date, together with copies of reports from Maj. G. B. Pillsbury, Corps of Engineers, dated December 2, 1912, April 11, 1914, and May 19, 1914, with map, on preliminary examination, survey, and supplemental report on survey, respectively, of Norwalk Harbor, Conn., made by him in compliance with the provisions of the river and harbor act approved July 25, 1912.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 7, 1914.

From: The Chief of Engineers, United States Army.

To: The Secretary of War.

Subject: Preliminary examination, survey, and supplemental report on survey of Norwalk Harbor, Conn.

1. There are submitted herewith, for transmission to Congress, reports dated December 2, 1912, April 11, 1914, and May 19, 1914, with map, by Maj. G. B. Pillsbury, Corps of Engineers, on prelimi-

nary examination, survey, and supplemental report on survey, respectively, of Norwalk Harbor, Conn., authorized by the river and harbor act approved July 25, 1912.

2. Norwalk Harbor is on the north shore of Long Island Sound, about 13 miles southwest of Bridgeport Harbor. The present project for its improvement provides for a channel 10 feet deep and 150 feet wide to South Norwalk, a channel 8 feet deep and of a general width of 100 feet from South Norwalk to Norwalk, and for a channel 6 feet deep and of a general width of 75 feet to the docks at East Norwalk. The district officer states that the improvement now desired by the navigation interests of the harbor is a wider, straighter, and deeper channel to the wharves at South Norwalk. Interested parties have suggested a channel 500 feet wide and 16 feet deep, departing considerably from the lines of the present channel, but the district officer is of opinion that the channel dimensions specified are greater than necessary. He submits a plan providing for a straight entrance channel 12 feet deep and 200 feet wide up to Dorlons Point, thence a channel 12 feet deep and 150 feet wide to South Norwalk and 250 feet wide along the wharves at South Norwalk to the highway bridge; an anchorage basin 10 feet deep and about 17 acres in extent opposite the entrance to East Norwalk; and a channel 10 feet deep and generally 100 feet wide from South Norwalk to the head of navigation at Norwalk, at an estimated cost of \$206,000. He is of opinion that the locality is worthy of improvement to this extent, and the division engineer concurs in this opinion.

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated June 30, 1914, concurring with the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the further improvement of Norwalk Harbor, Conn., is deemed advisable to the extent of providing a straight entrance channel 12 feet deep at mean low water and 200 feet wide up to Dorlons Point, thence 12 feet deep and 150 feet wide to South Norwalk, and 250 feet wide along the wharves at South Norwalk to the highway bridge; an anchorage basin 10 feet deep at mean low water and about 17 acres in extent opposite the entrance to East Norwalk; and a channel 10 feet deep and generally 100 feet wide from South Norwalk to the head of navigation at Norwalk, all as shown on accompanying map, at a total estimated cost of \$206,000 for first construction and \$8,000 annually for maintenance for the first three years and \$4,000 annually thereafter, including the maintenance of the existing channel 6 feet deep and 75 feet wide along the east side of the harbor to the head of navigation at East Norwalk. The initial appropriation should be \$88,000 and the work so prosecuted as to complete it in three years.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS
ON SURVEY.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 30, 1914.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The present project for Norwalk Harbor provides for restoration of the channel previously secured 10 feet deep and 150 feet wide to South Norwalk; for a channel 8 feet deep and of a general width of 100 feet from South Norwalk to Norwalk; and for a channel 6 feet deep, 2,900 feet long, and of a general width of 75 feet to the docks at East Norwalk. This project was completed in 1908 and restored to project dimensions in 1910. The tidal range is about 7.1 feet.

2. The commerce amounts to about 160,000 tons for South Norwalk, 65,000 tons for Norwalk, and practically nothing for East Norwalk, the totals ranging from about 206,000 tons to 243,000 tons.

3. Difficulties are now experienced in the navigation of the harbor through insufficient depth of the channel, its tortuous course, and congestion, due to the lack of anchorage room. A number of vessels regularly using the harbor below South Norwalk have a draft equal to, or exceeding, 10 feet. The steamboat operating between Norwalk, South Norwalk, and New York reports a loaded draft of 11 feet 6 inches, and many of the large oyster vessels have a draft exceeding 10 feet.

4. Observations show that the tides are frequently below mean low water, and a tide of -4 feet has been recorded. A depth of 12 feet is the minimum necessary to overcome present difficulties of navigation below South Norwalk. The greatest depth that can be economically provided above South Norwalk is 10 feet, due to the existence of ledge rock, but the district officer states that this depth will meet the pressing needs of navigation in this section. The existing channel leading into the harbor is tortuous, and he believes it to be advisable not to follow the lines of existing deep water, but to dredge a straight channel.

5. The following estimates are given in the report of survey and in a supplemental report requested by the board for the various plans of improvement indicated on the maps:

Outer harbor:

Channel 12 feet deep and 200 feet wide, following present alignment...	\$43,000
Channel of same dimensions, following a straight course.....	86,000

Upper harbor:

Channel 12 feet deep and anchorage basin 10 feet deep, the width of channel in front of city being 200 feet.....	66,000
Channel 12 feet deep and anchorage basin 10 feet deep, the width of channel in front of city being 250 feet.....	74,000

Channel South Norwalk to Norwalk:

10 feet deep and 100 feet wide, enlarged at bends.....	46,000
10 feet deep and 150 feet wide, enlarged at bends.....	58,000

6. The plan of improvement recommended by the district officer provides for a straight entrance channel 12 feet deep and 200 feet wide, thence a channel 12 feet deep, 150 to 250 feet wide, to the highway bridge at South Norwalk; a 10-foot anchorage, 17 acres in extent, opposite to the entrance to East Norwalk; a channel 10 feet

deep and generally 100 feet wide from South Norwalk to the head of navigation at Norwalk, the estimated cost of the improvement being \$206,000 for the initial work and \$8,000 annually for the first three years and \$4,000 annually thereafter for maintenance. The district officer is of opinion that the locality is worthy of improvement to this extent. The division engineer concurs generally with the district officer and invites attention to the fact that Norwalk Harbor is one of the places where it is evident that vessels navigating the New York State Barge Canal will have to be accommodated.

7. It seems from the information now in hand that the existing project is inadequate to meet present and reasonably prospective needs of commerce and navigation. The improvement should result in a saving in towage charges and a reduction in freight rates on a considerable water-borne tonnage, and should be of benefit to the extensive oyster business of this locality. The board believes that resulting benefits would be sufficient to justify the cost, and therefore reports that in its opinion it is advisable for the United States to undertake the improvement proposed by the district officer as shown upon the accompanying map, at a total estimated cost of \$206,000 for initial work and \$8,000 annually for the first three years and \$4,000 annually thereafter for maintenance. The initial appropriation should be \$88,000 and the work so prosecuted as to complete it in three years.

8. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF NORWALK HARBOR, CONN.

UNITED STATES ENGINEER OFFICE,
New London, Conn., December 2, 1912.

From: District Engineer Officer.

To: Chief of Engineers, United States Army
(Through the Division Engineer).

Subject: Report on preliminary examination of Norwalk Harbor, Conn.

1. The following report of the preliminary examination of Norwalk Harbor, Conn., is submitted in compliance with the requirements of the act of Congress approved July 25, 1912.

2. Norwalk Harbor lies on the north shore of Long Island Sound, about 13 miles to the southwest of Bridgeport Harbor. It consists of the tidal portion of Norwalk River, extending from Norwalk to the river mouth, a distance of about 3 miles, and of the outer harbor, also known as Sheffield Harbor, lying between the Norwalk Islands and the mainland. Above Norwalk the river has a boulder-strewn and rocky bed and is not navigable. South Norwalk is situated on the west bank about $1\frac{1}{2}$ miles below Norwalk. At this point the

river bedens into a shallow bay, on the opposite side of which East Norwalk is situated.

3. The depth which could originally be carried to South Norwalk was about 5 feet at low tide. Between South Norwalk and Norwalk the river bed was nearly bare. East Norwalk was connected with the main channel by a small branch nearly bare at low tide. The improvement of the locality by dredging was initiated by the General Government under the act of July 10, 1872, and extended from time to time under various modifications of the original project. The present project was adopted by the act of March 3, 1897, and provides for the restoration of a channel previously secured 10 feet deep and 150 feet wide to South Norwalk; for a channel 8 feet deep and of a general width of 100 feet from South Norwalk to Norwalk; and for a channel 6 feet deep, 2,900 feet long, and of a general width of 75 feet to the docks at East Norwalk, all at an estimated first cost of \$65,500, and \$8,000 per annum for maintenance. The project was completed September 19, 1908. The channels were restored to their project depth in 1910 and the existing condition of the improvement is believed to be good, the cost of maintenance being much less than that estimated. A draft of about 9 feet at mean low water can be carried to South Norwalk; about 8 feet to Norwalk; and about 6 feet to East Norwalk. The mean rise and fall of the tide is 7.1 feet. The waterway is not subject to freshets or to variation in the water level other than the rise and fall of the tide.

4. The channel between Norwalk and South Norwalk is crossed by two bridges, both having swing draw spans and affording a least width in the clear of 57 feet. There is a fixed highway bridge at the head of navigation at Norwalk.

5. The report of the examination and survey on which the present project is based is printed in House Document No. 262, Fifty-ninth Congress, second session. The report of a subsequent examination and survey of Norwalk outer harbor, with a view to the removal of a shoal near to and west of White Rock, and also to straightening the main channel between Gregorys Point and South Norwalk, is printed in House Document No. 396, Sixty-first Congress, second session, with map. As a result of this examination and survey it was recommended that the outer portion of the channel be increased in width to 200 feet as far as the point where the East Norwalk channel separates from the main channel, and that the channel be widened in the outer harbor opposite White Rock to a width of 300 feet. The estimated cost of the improvement was \$3,500. It has not received congressional sanction. The previous examinations and surveys are indicated in the following table:

Section.	Congressional documents.				Annual Reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire harbor.....	Senate.....	23	42d	2d	1872	900
Do.....	House.....	82	52d	2d	1893	992
Do.....	House ¹	50	54th	1st	1896	813
South Norwalk.....	House.....	129	55th	2d	1898	989

¹ With map.

6. The commerce of Norwalk Harbor has shown no marked increase or decrease during the past 10 years, but has fluctuated to a considerable degree. The largest amount of shipments and receipts for the whole harbor during the 10 years, was 281,970 short tons in 1906. For the calendar year 1911 the tonnage reported was 206,248 short tons, valued at \$16,225,707. Of this amount, 156,495 tons was handled at and below South Norwalk and 49,752 tons at Norwalk, with none reported at East Norwalk. A line of freight steamers make daily trips between Norwalk, South Norwalk, and New York during the greater portion of the year. South Norwalk is the center of an extensive oyster fishery and is much used by the steam and gasoline trawlers pertaining to this industry.

7. The improvements now desired by the navigation interests of the harbor are a wider, straighter, and deeper channel to the wharves at South Norwalk. It appears that the present channel, below South Norwalk, is much congested during the spring months, when a considerable number of schooners come to the harbor for seed oysters, and lie in the channel, there being no other anchorage area of sufficient depth. Moreover, as the channel is quite crooked, barges must be towed into the harbor abreast the tug, and these tows occupy a considerable portion of the existing channel. For this reason and because, on account of its turns, the exact limits of the channel are not clearly defined, vessels quite frequently ground in attempting to pass each other. It is thought by the navigation interests that a wider and straighter channel in the upper portion of the harbor would alleviate its obstruction by the ice which now comes down the river and lodges on the low-water banks below the South Norwalk docks. As the oyster fishery is carried on throughout the winter, the obstruction of the channel by ice is much more serious in this harbor than in others. A greater depth is desired, because the present channel has not sufficient depth to afford uninterrupted navigation by the vessels that use it. Some of these vessels have a draft of over 10 feet. As the tide falls, at extreme low water or under the influence of the wind, between 1 and 2 feet below mean low water, the project depth of 10 feet is reduced at such times to between 8 and 9 feet.

8. To remedy the difficulties of navigation, those interested propose, through the South Norwalk Board of Trade, a channel 500 feet wide and 16 feet deep departing considerably from the lines of the present channel. It is believed that this proposition is advanced without realization of the magnitude of its cost as compared with the prospective benefits. As the outer harbor has depth not much exceeding 11 feet at mean low water, the proposed depth would not serve any useful purpose unless it were extended some 2 miles to deep water in the sound, and this extension would be costly of maintenance. The proposed width would be justified only by a traffic much greater than any that can now be foreseen at this port. It is believed, however, that the conditions complained of can be remedied to a large extent at a reasonable cost by enlarging the present channel between South Norwalk and Dorlons Point to afford a straighter channel and an anchorage area and by providing as great a depth in the channel as now exists in the outer harbor. In addition, it is believed that the entrance from the outer harbor is now

so difficult of navigation as to justify the straightening of this channel in a more radical manner than that recommended in the report of the previous survey, if this improvement can be secured at reasonable cost.

9. I am of the opinion therefore that Norwalk Harbor is worthy of improvement by the General Government, and recommend that a survey be authorized to determine the proper extent and cost of the improvement.

10. The wharves contiguous to this waterway are located at Norwalk, South Norwalk, and East Norwalk and are the usual pile or crib structures used for that purpose. A short distance above South Norwalk there are located the wharves which served the Danbury & Norwalk Railroad when this line had its terminus at the port. These docks still have rail connections, but are not, in their present condition, available for use. A public wharf is regarded as desirable, both at Norwalk and South Norwalk, at such points on the water front convenient to the highways as could be most advantageously secured by the local authorities.

11. As Norwalk Harbor is a tidal waterway, there are no questions of water power or other related subjects involved in its improvement.

12. A sketch of the harbor is transmitted herewith.¹

G. B. PILLSBURY,
Major, Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, December 4, 1912.

TO CHIEF OF ENGINEERS, UNITED STATES ARMY:

Concurring in the recommendations of the district engineer.

W. M. BLACK,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
December 10, 1912.

TO the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. For reasons stated herein the board concurs with the district officer and the division engineer in recommending a survey in order to determine the extent and advisability of the improvement.

For the board:

WM. T. ROSSELL,
*Colonel, Corps of Engineers,
Senior Member of the Board.*

¹ Not printed.

SURVEY OF NORWALK HARBOR, CONN.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
New London, Conn., April 11, 1914.

From: The District Engineer Officer.

To: The Chief of Engineers, United States Army
(Through the Division Engineer).

Subject: Survey of Norwalk Harbor, Conn.

1. The following report on the survey of Norwalk Harbor, Conn., is submitted in compliance with departmental letter of December 14, 1912, and pursuant to the requirements of the river and harbor act of July 25, 1912.

2. The survey was made by the usual methods, and included both the water and shore features. The mean low water datum was determined from a series of continuous observations with an automatic gauge, covering a period of three months. Numerous probings were made to determine the character of the material whose removal is contemplated under the project proposed and recommended in this report. Where the material, while not rock, was too compact to be penetrated by a rod forced down by hand, a heavy steel rod was driven with a pile-driver hammer. A map,¹ reduced from the detail sheets of the survey, together with these detail sheets,¹ accompanies this report.

3. A description of the harbor and of its previous improvements is given in the report on the preliminary examination submitted December 2, 1912. Since the date of the report the cities of Norwalk and South Norwalk have consolidated, the new city including as well East Norwalk. Their previous names are herein retained to designate the localities in question. The difficulties now experienced in the navigation of the harbor, through the insufficient depth of the channel, its tortuous course, and its congestion on account of the lack of other anchorage area, together with the commerce affected, were set forth in the preliminary examination. A careful investigation made in connection with the survey shows that these difficulties are very real, and that the commercial interests involved are sufficient to justify a considerable expenditure in their amelioration.

4. That the present depth of 10 feet at mean low water in the channel between South Norwalk and the harbor entrance is insufficient for the existing commerce is apparent from the fact that a considerable number of vessels regularly using this portion of the harbor, engaged in commerce of a character such that delays are costly, have a draft equaling or exceeding 10 feet. The steam boat operating between Norwalk, South Norwalk, and New York, reports a draft of 11 feet 6 inches, loaded, and many of the larger oyster trawlers have a draft exceeding 10 feet. As such self-propelled craft must have some water under their keels to navigate even a wide and straight channel, it is evident that at mean low water the depth is insufficient for their navigation. But during from five to six days during each month the water normally falls from a foot to a foot and a half below mean low water, and strong westerly winds, with high barometric pressure, drive the water considerably lower. In the period of three months, covered by the automatic tide gauge records, 17 tides fell 2 feet or more below mean low-water level, of which 6

¹ Not printed.

fell to 3 feet or more below, 1 to 3.9 feet, and 1 to 4 feet. On the latter of these occasions the depth in the channel was less than its mean low-water depth for more than half the tidal period. During such low runs of the tide the vessels under consideration are unable to enter or leave the harbor for long periods during the day. While the expenditure necessary to secure a practicable channel of depth sufficient to meet these extreme conditions would be unwarranted, a channel of a depth to admit the usual run of local vessels at ordinary low tides and the larger of such vessels at mean low water is extremely desirable. A depth of 12 feet at mean low water from Long Island Sound to South Norwalk is the minimum necessary to this end.

5. The depth necessary in the channel between South Norwalk and Norwalk, from the viewpoint of the navigation of the vessels considered in the preceding paragraph, is not as great as that below the former point, as this channel is not ordinarily traversed by the oyster trawlers, these discharging at South Norwalk; and as the regular steamerboat runs comparatively light through this channel, taking on and discharging a considerable portion of its cargo at the lower terminal. An increase in depth in the channel is, however, greatly desired by manufacturers and dealers who receive bulk freight, such as coal, wood pulp, etc., through this channel, in order to reduce the transportation costs. The depth which can be provided without excessive cost is limited by ledge rock underlying the basin at the head of the channel to 10 feet at mean low water, and this depth is consequently proposed for the channel between South Norwalk and Norwalk.

6. The natural channel leading into the harbor from Long Island Sound through Sheffield Island Harbor is extremely tortuous. A limited amount of dredging, the last of which was done 10 years ago, has served to provide a channel at least 10 feet deep and of width generally exceeding 200 feet; but the channel, although reasonably well marked, is very difficult of navigation. To secure depth of 12 feet, now proposed, in this natural channel, sufficiently enlarging the turns to render the increased depth useful to navigation, would require the dredging of considerable areas, at no small cost. The resulting channel would be far from satisfactory. I believe it to be a wiser expenditure to provide a straight channel, 12 feet deep at mean low water and 200 feet bottom width, from the 12-foot contour in Sheffield Island Harbor to Black Buoy Point, as shown on the map, connecting with the straight natural channel 12 to 20 feet deep and not less than 200 feet wide, to Dorlons Point. The cost of this channel is believed to be fully justified by the resulting benefit to navigation.

7. The need for an anchorage ground in the upper harbor was pointed out in the report on the preliminary examination. It is proposed to provide an anchorage basin 10 feet deep and 17 acres in area by enlargement of the existing 10-foot channel between Dorlons Point and the South Norwalk wharves, and to excavate a new 12-foot channel, 150 feet wide, on the westerly side of the basin, as shown on the map. The proposed arrangement of channel and basin will utilize the excavation already done, and will afford a much more satisfactory channel, eliminating the present 35° turn at the junction of the main channel with that to East Norwalk. The improvement should, besides, greatly mitigate the ice conditions during severe winters. It will be noted that the present channel leading south from

the South Norwalk wharves crosses the harbor in a diagonal direction. The ice brought down by the ebb tide lodges and piles up against the adjacent flats to the west, and it is only with great difficulty that the channel can be kept open. It is expected that a channel more nearly in the direction of the tidal flow at the first of the ebb will not be so obstructed.

8. The width of the channel along the South Norwalk wharf front has been increased to 250 feet, this width being necessary to afford reasonably convenient access to the slips between the wharves.

9. The proposed channel between South Norwalk and Norwalk follows the present channel, the depth being increased to 10 feet at mean low water, and the minimum width, except at the gorge at Norwalk, being 150 feet, with increased width at the turns. This channel will greatly relieve the difficulties now experienced in navigating this reach.

10. No freight has been reported as landed from the East Norwalk channel for the last two years. I am informed, however, that it is proposed to again utilize this channel, and I believe it desirable to maintain it as now authorized, 6 feet deep and of a general width of 75 feet.

11. The cost of the improvements proposed in Norwalk Harbor is estimated as follows:

Outer harbor.

Channel from Sheffield Island Harbor to Black Buoy Point:

Dredging, 81,000 cubic yards mud, at 20 cents.....	\$16,200	
Dredging 155,000 cubic yards hard material, at 40 cents.....	62,000	
Administration and inspection.....	7,800	
		\$86,000

Upper harbor.

Channel and anchorage basin:

Dredging, 450,000 cubic yards mud, at 15 cents.....	67,500	
Administration and inspection.....	6,500	
		74,000

Norwalk River.

Channel South Norwalk to Norwalk:

Dredging, 215,000 cubic yards mud, at 16 cents.....	34,400	
Dredging 54,000 cubic yards hard material, at 30 cents.....	16,200	
Dredging 200 cubic yards bowlders, at \$10.....	2,000	
Administration and inspection.....	5,400	58,000

Total for harbor..... 218,000

The cost of maintaining the channels now authorized was estimated at \$8,000 per annum. This cost was based on prior experience, while the channels were in a formative stage. The actual cost of maintaining the channels after the side slopes had become stable has proved considerably less than that estimated. Since the completion of the project in 1908 but 6,000 cubic yards have been dredged in maintenance operations, and it will be noted that the survey shows the channels to be, in general, in excellent condition. Shoaling is marked only at the bends, a potent factor in creating this condition being the disturbance created by vessels which have lost the channel and grounded at these places. For a short period after the completion of the project, while the side slopes are acquiring equilibrium, it may be expected that the cost of maintaining the proposed project will be relatively high. After these slopes have acquired stability

the cost should be less than under the present project, on account of the elimination of the sharp turns. The cost of maintenance is therefore estimated at \$8,000 per annum for the first three years and \$4,000 per annum subsequently.

12. The proposed plans for improvement are submitted after conference with those interested in the improvement of the harbor. While there is a strong desire on the part of the responsible citizens who are familiar with the conditions for a considerably more extended improvement, I am of the opinion that the expenditures necessary to materially enlarge the proposed plans would not be justified. It is somewhat confidently expected that with the straight and easily marked channels proposed the facilities will fulfill all reasonable needs of the immediate future.

13. The commerce affected by the improvement was briefly set forth in the report on the preliminary examination. Since the date of that report the commercial statistics for the calendar year 1912 have been received and tabulated. A detailed statement of the commerce during the calendar years 1908-1912 is as follows:

South Norwalk.

Articles.	1908	1909	1910	1911	1912	Average.
	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>	<i>Short tons.</i>
Coal.....	60,938	66,361	64,226	62,525	66,572	64,124
Lumber.....	4,480	3,000	5,000	3,000	1,576	3,411
Sand and clay.....	2,554	3,986	3,289	3,398	7,265	4,098
Stone.....			1,120		8,550	
Oysters.....	25,148	32,784	28,969	44,253	27,152	31,661
Oyster shells.....	13,839	6,856	15,660	13,222	17,496	13,415
Steamboat freight.....	30,016	35,000	39,700	25,997	35,400	33,223
Miscellaneous.....	3,700	2,153	2,422	4,100	4,800	3,435
Total.....	140,675	150,140	160,386	156,495	168,811	155,301
Valuation.....	\$11,664,357	\$14,957,872	\$16,812,674	\$11,554,553	\$15,051,073	\$14,239,466

Norwalk.

Coal.....	15,680	28,484	26,053	25,885	28,478	24,916
Lumber.....	1,342	4,566	2,472	2,377	3,679	2,887
Sand and clay.....	838	855	3,056	1,197	11,962	3,582
Stone.....					4,483	
Wood pulp.....	12,432	12,000	12,600	6,400	11,038	10,894
Steamboat freight.....	20,720	22,900	27,000	11,014	14,420	19,211
Miscellaneous.....	4,592	1,400	2,024	2,880	798	2,339
Total.....	55,604	70,205	73,205	49,753	74,858	64,725
Valuation.....	\$7,680,994	\$9,551,835	\$11,156,500	\$4,671,154	\$6,134,957	\$8,019,176

East Norwalk.

Coal.....	3,186	2,442	600			2,076
Valuation.....	\$14,399	\$11,560	\$2,850			\$9,861

Total for the harbor.

Tonnage, short tons.....	199,465	222,787	234,191	206,248	243,669	221,272
Shipments.....	44,372	43,899	52,700	37,745	40,179	43,779
Receipts.....	155,093	178,888	181,491	168,503	203,490	177,493
Valuation.....	\$19,359,751	\$24,521,307	\$27,972,024	\$16,225,707	\$21,186,030	\$22,268,503

NOTE.—To afford proper comparison the same unit values are used in the calendar years 1909, 1910, and 1911 as in the calendar year 1912.

The amounts carried as the total for the harbor would be benefited by the improvement up to South Norwalk. The amount carried under the heading of Norwalk would be benefited by the improvement of the channel between South Norwalk and Norwalk.

14. The communities forming the present city of Norwalk had a population of 24,211 in 1910 and showed an increase of 21.4 per cent during the preceding decade. The city lies on the main line of the New York, New Haven & Hartford Railroad and is the southern terminus of a branch running through the western portion of Connecticut. Its principal industry is manufacturing; but South Norwalk is the seat of an extensive oyster business, in which a number of large concerns are engaged, the oysters being shipped to all parts of the United States and to Europe. The value of this product during the calendar year 1912 was somewhat over \$500,000. The low ground bordering the Norwalk River is admirably adapted to the establishment of factories, and such may be expected to follow an adequate channel improvement.

15. That the improvement will materially reduce transportation charges is, I believe, certain. The present water rate on coal from the New Jersey terminals to South Norwalk is 35 cents per ton. The rate to Norwalk is occasionally as high as 40 cents. In the Cedar Creek branch of Bridgeport Harbor, with commerce about equal in amount to that in Norwalk Harbor and with an easily navigable channel 12 feet in depth, as proposed for the lower channel in Norwalk Harbor, the rate is about 30 cents per ton, while rates as low as 25 cents are sometimes obtained and of 28 cents are understood to be quite common. The haul to Bridgeport Harbor is considerably longer than to Norwalk. The discrepancy in existing rates is easily explained by the fact that barges consigned to Bridgeport usually carry 800 to 1,000 tons, while I am informed that, on account of the present difficulties of navigation, the loads to Norwalk and South Norwalk average about 500 tons and rarely exceed 550 tons. A reduction of at least 5 cents per ton in the transportation cost of coal may therefore be expected. A similar reduction in the rate on other freight is anticipated. The St. George Pulp & Paper Co., at Norwalk, state that deepening the channel in the river from 6 to 8 feet, under the existing project, resulted in reducing their water transportation cost on pulp by about 16 per cent and that, in their opinion, the proposed 10-foot depth would further decrease the rate by about 12½ cents per ton. No definite data could be secured as to the probable saving on the transportation of other commodities. With the improved channels, however, it will be possible to take tows directly to the proposed anchorage basin instead of leaving them in the outer harbor to be taken in, one or two at a time, through the present tortuous channel; and schooners and other sailing craft, with a favoring wind, will likewise proceed directly to this basin with a large reduction in towage charges. The financial loss, direct and indirect, suffered by the steamboat line and by those engaged in the oyster industry, through delays and damages consequent to the existing conditions, is very considerable and will, in large part, be overcome by the proposed improvement.

16. In view of the considerations detailed I am of the opinion that Norwalk Harbor, Conn., is worthy of further improvement to the extent of providing—

A main channel 12 feet deep from the 12-foot curve in the Sheffield Island Harbor to the highway bridge at South Norwalk, 200 feet wide to Dorlons Point, thence 150 feet wide to South Norwalk, and 250 feet wide along the wharf frontage of South Norwalk.

An anchorage basin 10 feet deep and about 17 acres in area in the upper harbor.

A channel 10 feet deep and generally 150 feet wide, with increased width at the turns, from South Norwalk to the head of navigation in the Norwalk River.

The maintenance of the existing channel 6 feet deep and 75 feet wide along the east side of the harbor to the head of navigation at East Norwalk.

The estimated cost of the improvement is \$218,000 for the initial improvement, \$8,000 annually for the first three years, and \$4,000 annually thereafter for maintenance.

17. The proposed outer channel is regarded as suitable for the navigation of vessels of a maximum draft of 10 feet at all usual tides, 11½ feet at mean low water, and 18 feet at mean high water; the channel above South Norwalk for vessels of a maximum draft of 9½ feet at mean low water and 16 feet at mean high water; the channel to East Norwalk for vessels of 12 feet draft at mean high water, for which vessels, respectively, these channels are designed.

18. Should the project be adopted by Congress, the work should be prosecuted in the interests of economy at a rate sufficient to secure its completion in three years. To this end an initial appropriation of \$88,000 is necessary, followed by two appropriations of \$65,000 each.

G. B. PILLSBURY,
Major, Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEER,
NORTHEAST DIVISION,
New York City, April 15, 1914.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded. I concur in general with the district engineer officer.

2. The plans are well considered, and the estimates are believed to be conservative and safe. The new channel at Long Beach and in front of South Norwalk encroaches somewhat on land lying above the mean low-water contour. In Connecticut titles run to high or low water according to the wording of the individual deeds. It will be well therefore to make this widening conditional by law upon the donation free of cost to the United States of any land which may be privately owned between high and low water lines.

3. It is well to call attention to the fact that Norwalk Harbor is one of the places where it is evident that vessels navigating the New York State Barge Canal will have to be accommodated. This

of itself calls for the depth of 12 feet in the entrance channel, and 12 feet would be desirable above the New York, New Haven & Hartford Railroad bridge, but, as reported by the district engineer officer, rock makes it too expensive at the present time.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For Report of the Board of Engineers for Rivers and Harbors see page 3.]

SUPPLEMENTAL REPORT ON NORWALK HARBOR, CONN.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
New London, Conn., May 19, 1914.

From: The District Engineer Officer.

To: The Chief of Engineers, United States Army
(Through the Division Engineer).

Subject: Supplementary report on Norwalk Harbor, Conn.

1. The following additional estimates covering certain modifications of the proposed improvement for Norwalk Harbor, Conn., detailed in the letter of the Board of Engineers for Rivers and Harbors, dated May 5, 1914, are submitted in compliance with the instructions of the Chief of Engineers in indorsement of May 11, 1914, thereon:

2. The estimate (a) for a channel in the outer harbor 12 feet deep at mean low water and generally 200 feet wide, suitably enlarged at the bends, following substantially the line of the present channel, is as follows:

Dredging 95,000 cubic yards mud, at 20 cents.....	\$19,000
Dredging 51,000 cubic yards hard material, at 40 cents.....	20,400
Administration, inspection, and contingencies.....	3,600
Total.....	43,000

The estimate submitted in the original report for a straight channel through this section is \$86,000.

3. The channel lines to which the estimate given in the preceding paragraph applies were laid down with a view to securing a usable channel with the minimum expenditure, and are shown on the accompanying detailed and general sheets. It will be noted that this channel describes two bends, its upper portion taking an S form. One of these two bends could be eliminated, and the second bend somewhat improved, by additional dredging, the cost of which is estimated at \$12,600. In view of the fact that one turn would impede navigation to substantially the same degree as two, I do not believe that this additional expenditure, to remove but one of the turns, is justified.

4. The alternative of improving the natural channel, instead of providing a straight channel, was carefully considered before the latter course was recommended in the original report. A renewed study confirms my belief that the additional cost of the straight channel is justified by its advantage to commerce. The natural channel, after improvement, can undoubtedly be navigated with safety by vessels under complete control, in charge of an expe-

rienced pilot, in clear weather and with a clear channel. I do not believe, however, that it can be safely navigated by tows of barges, in which the greater portion of the commerce is carried. These must anchor in the outer harbor, and be brought in one or two at a time, as is now the practice; and the added cost of towage, loss of time, and danger of grounding through being forced out of the channel on meeting other craft at the bends, etc., will go far toward maintaining the present relatively high water-freight rates into Norwalk Harbor. With a straight channel, properly marked by suitable buoys and ranges, vessels and tows will be able to proceed directly to the anchorage basin, without incurring this additional expense. It may be pointed out that there is a broad, natural channel, lighted and buoyed, leading easterly from the entrance to the river to the Sound, in which about 14 feet of water is available at mean high tide. While this channel is not adequate as an entrance for heavier commerce, and, on account of its length and position, could not be advantageously improved for such purpose, it may be expected that if the westerly entrance is made easily navigable, the lighter tows, bound east or west and having barges to deliver to or take from Norwalk, will enter by one channel and leave by the other, with a very considerable saving in time and convenience. This last point is indeed incidental only, the main consideration being that, with a straight entrance channel, the reduction in the freight rates, on which the recommendation for a considerable expenditure was largely based, should be amply realized, while with a crooked entrance channel the reduction in rates may be quite disappointing.

5. The project depth for the channel to South Norwalk has been progressively increased from 6 feet at mean low water in 1872, 8 feet in 1881, to 10 feet under the present project, adopted, as concerns this channel, in 1897. It can scarcely be expected that the improvement will stop at a depth of 12 feet; on the contrary, an extension of the project, involving greater channel depth, appears inevitable at some future time. It must be observed that, even if the present alignment be then continued, the cost of the increase in depth will be materially more than were it straight, on account of the greater width at the bends, and the greater length. The expectation of a future enlargement thus lends added weight to the desirability of adopting the most desirable alignment at the present time.

6. As remarked in the original report, it has been the experience in this, as in other similar harbors, that shoaling is marked only at the bends, straight channels almost uniformly showing great permanence after the side slopes have come to an equilibrium. It may be well expected, therefore, that the straight channel would be the cheaper to maintain.

7. The estimate (b) for a channel in the upper harbor as proposed, except that the width in front of the city be 200 feet instead of 250 feet, is as follows:

Dredging 400,000 cubic yards, mud, at 15 cents.....	\$60,000
Administration and inspection.....	6,000
Total.....	66,000

as compared with \$74,000 in the original estimate.

8. The channel width in front of the city under the present project is 150 feet, increased at the turn to 200 feet. As the wharves are, in general, built at right angles to the channel, accommodating vessels in the intervening slips, and as the channel is often fairly well occupied by traffic, a reasonable amount of space for maneuvering and turning vessels is desirable in front of the city. It is very strongly felt by those interested in the navigation of the harbor that the present channel at this point should be materially widened, and in this view I concur. The local interests desire, in fact, a width of at least 300 feet, but it was thought that a width of 250 feet would prove sufficient to meet present needs. Even this width can not be termed essential. Its convenience to navigation, as compared with the width of 200 feet, is believed, however, to be well worth its additional cost.

9. The estimate (c) of the cost of a channel 10 feet in depth and generally 100 feet wide, instead of 150 feet wide, between South Norwalk and Norwalk, is as follows:

Dredging 167,000 cubic yards mud, at 16 cents	\$26,720
Dredging 47,000 cubic yards hard material, at 30 cents	14,100
Dredging 100 cubic yards bowlders, at \$10	1,000
Administration and inspection	4,180
Total	46,000

The original estimate for a channel 150 feet wide is \$58,000.

10. The channel to which the estimate in the preceding paragraph applies is that shown by the heavier lines on the accompanying maps. It follows substantially the lines of the present channel, except at the bends, where material enlargements are made. The character and extent of these enlargements was discussed very fully with the manager of the towing line handling all, or nearly all, of the large craft which now pass through the channel, and the enlargements proposed are those believed necessary for the larger vessels that are expected to use the channel after greater depth is provided.

11. In detail, the revised channel, beginning at the railroad bridge, follows the present lines to the approach to the first turn at Squirrel Point, where it is enlarged to 125 feet on the approach, and 165 feet at the turn. The long curve above Squirrel Point is converted into a straight reach with two bends, the width in the reach being 125 feet, on account of its shortness. The second turn is given a width of 175 feet, as in the original plan, but in a preferable location. The reach from Squirrel Point to Oyster Shell Point has the present width of 100 feet, with a slight shift in alignment. The present turn in the channel at Oyster Shell Point has so sharp a curvature that it can be navigated only with the greatest difficulty, although 150 feet in width. For the channel recommended in the original report, the point was to be cut back to give a width of 225 feet. On further consideration I am led to believe that it is very advisable to reduce the degree of curvature as well as to increase the width of the channel at this place. The desired result can not be accomplished by cutting back the convex point; but is attained, in the revised lines, by extending the curve above the bend into the concave bank. A corresponding enlargement below the turn, for the benefit of out-bound vessels, is not believed necessary, as such vessels are always light, and can be swung around the bend with comparative ease. Above Oyster Shell Point, the revised channel is contracted to a

width of 100 feet just below the bend at Jennings Wharf, again widened, through the bend, to 150 feet, and continued in a reach 100 feet wide to Ferrys Point. The bend at Ferrys Point is used as a turning basin for vessels outbound from the Norwalk wharves, the basin at the head of the channel being of too small an area, and too congested by discharging vessels to serve this purpose. Under the provisions of the river and harbor act of August 18, 1894, an extensive area at Ferrys Point was dredged to a depth of 6 feet, removing the flats between the channel, as it then existed, and the harbor line. The maintenance of this area was not included in the subsequent project for the 8-foot channel, and it has now shoaled to a depth of 3 feet or less. On account of this previous dredging the bend can be enlarged to a width of 200 feet at reasonable cost, and this enlargement will serve a most useful and necessary purpose. From Ferrys Point to the head of navigation the proposed channel must necessarily follow the present lines.

12. A general width of 150 feet for the channel between South Norwalk and Norwalk was recommended with the view that on account of the tortuous course this width was necessary for the reasonably convenient and safe navigation of the larger vessels that may be expected to use the channel after the increased depth is provided. By enlarging the turns as indicated, a channel of a general width of 100 feet may, however, well serve this purpose.

13. Summing my views on the alternative plans, I believe that it would be decidedly inadvisable to enlarge the existing tortuous natural channel in the outer harbor, in lieu of excavating a straight channel. The proposed width of 250 feet for the channel in front of the South Norwalk wharves, while by no means absolutely essential, is very desirable, and it is my opinion that its added cost as compared with a channel 200 feet wide is justified by the increased convenience it will confer. I believe, however, that a general width of 150 feet for the proposed channel between South Norwalk and Norwalk may be somewhat greater than is now essential, and that a channel 10 feet deep and 100 feet wide, if enlarged at the bends as herein detailed will be sufficient for present needs.

G. B. PILLSBURY,
Major, Corps of Engineers.

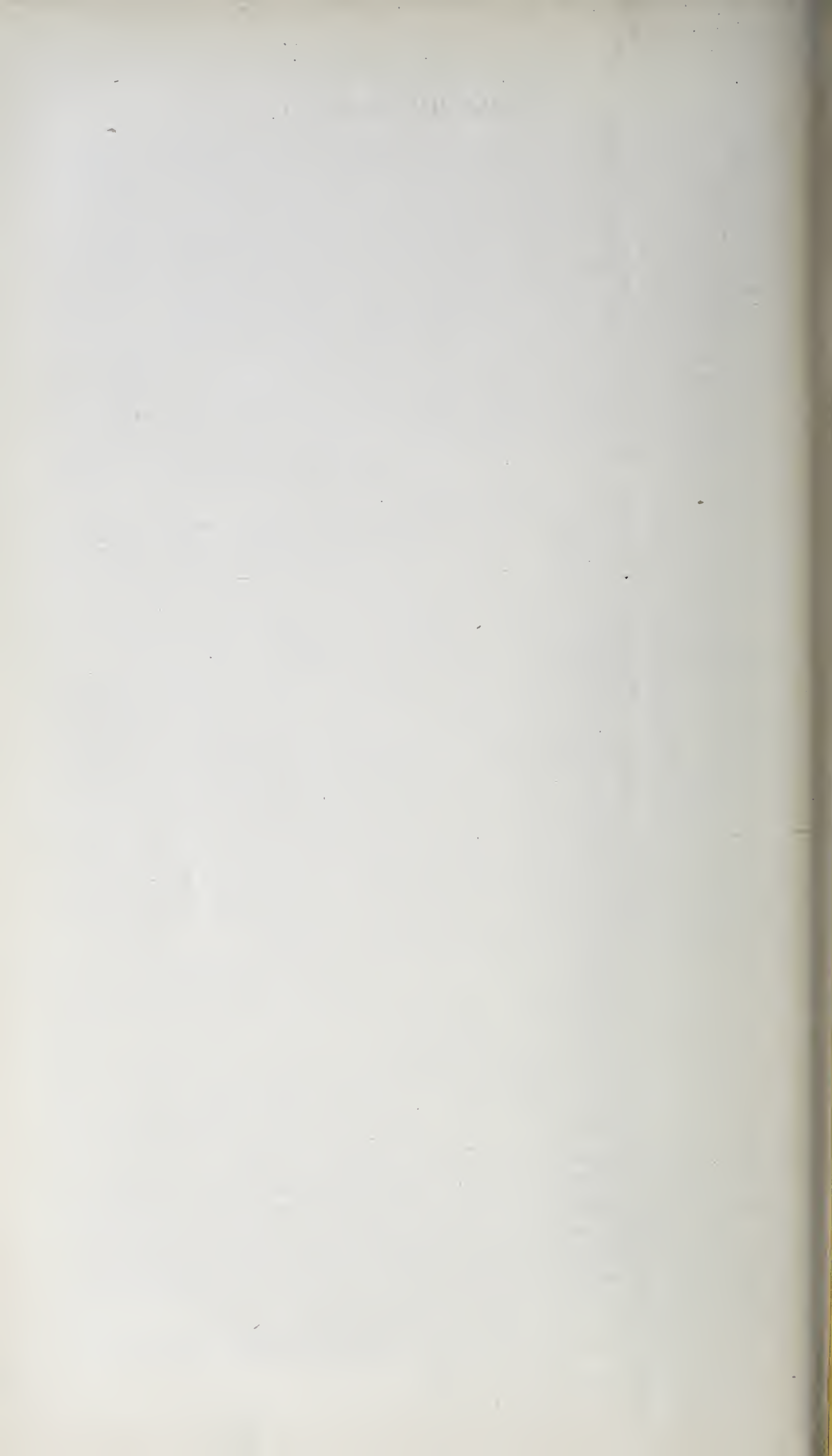
[First indorsement.]

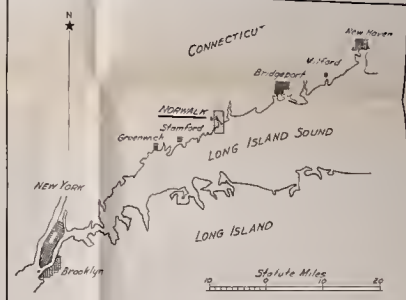
OFFICE OF DIVISION ENGINEER,
NORTHEAST DIVISION,
New York City, June 23, 1914.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

Forwarded. I concur with the district engineer officer's views as expressed in paragraph 13. I have carefully discussed the matter with him, and his recommendations are made after thorough conference with the manager of the towing company using the channel above South Norwalk, whom he states to be "a very sensible and practical man."

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.





WIND FREQUENCIES 1912

THE MEAN RANGE OF TIDE IS 70 FEET
MEAN LOW WATER IS SHOWN THUS

TIDE & FOUNT CENTUR

" 12 "

SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER
TO DEPTHS AT MEAN LOW WATER

B N W 7 S E CORNER OF S W QUARTER OF W ABUTMENT
OF R BRIDGE OVER NORWALK RIVER ELEVATION ABOVE MEAN
LOW WATER 130'

TOPOGRAPHY ABOVE KEYSPOT POINT AND VIGNETTE TAKEN DURING
OCTOBER AND NOVEMBER 1953 AND JANUARY 1954 REMAINDER OF
TOPOGRAPHY FROM U S C G S CHART NO 267

HYDROGRAPHY TAKEN DURING SEPTEMBER AND OCTOBER 1953

CHANNEL LINES PROJECT OF 1907 SHOWN THUS -----

" " PROPOSED BY DISTRICT OFFICER SHOWN THUS -----

" " PROPOSED ALTERNATE LAYOUT SHOWN THUS -----

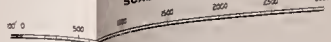
1913

NORWALK HARBOR

CONNECTICUT

MAJOR G. E. B. SURVEYED UNDER DIRECTION OF
HILLSBURY CORPS OF ENGINEERS, U S ARMY
BY G. E. VERRILL, ASST ENGR AND
JAMES, JUN ENGR

SCALE OF FEET



ENGINEER OFFICE, U. S. ARMY
NEW LONDON CONN
MAY 15, 1944

TO ACCOMPANY REPORT ON SURVEY OF WORK
CONNECTICUT MADE IN COMPLIANCE WITH ACT OF CONGRESS
APPROVED JULY 25 1922

MAJOR CORPS OF ENGINEERS

